

REMARKS

Claims 1-6 and 8-30 are pending in the application.

Response to Claim Rejections under 35 U.S.C. § 112

At page 6 of the Office Action, claims 19 and 27 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. According to the Examiner, the claims lack a definition for enzyme activity.

Applicants traverse and respectfully request the Examiner to reconsider in view of the following remarks.

In the present invention, the laccase activity was determined using ABTS (2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid)) as a substrate. The activity of laccase was measured at room temperature using pH 4.5 as the determination pH and expressed in nanokatals (nkat). The SI unit of catalytic activity is defined as the amount of enzyme activity that converts 1 mol of substrate per second in the assay conditions. The specific conditions of each chemical reaction are described in the working examples so that enzyme activity can be calculated in katal for each condition.

In view of the foregoing, a person having ordinary skill in the art would be able to ascertain the definition of enzyme activity with respect to the present invention. The document by Niku-Paavola et al. [1988]¹ is enclosed herewith to provide evidence of what is known in the art. In the document by Niku-Paavola et al. [1988], laccase activity is calculated in the same way as that of the present invention.

¹ Niku-Paavola M-L, Karhunen E, Salola P, Raunio V. Lignolytic enzymes of the white-rot fungus *Phlebia radiata*. Biochem. J. 1988:254; 877-884 is enclosed herewith.

In view of the above, it is respectfully requested that the § 112, second paragraph, of claims 19 and 27 be withdrawn.

Response to Double Patenting Rejections

At page 8 of the Office Action, claims 1-5, 8-10 and 12-26 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claims 1-4, 6-10, 12, 13, 15-22 and 24 of copending Application No. 10/583,339. At page 9 of the Office Action, claims 1-5 and 8-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claims 1-4, 6, and 8-20 of copending Application No. 10/583,711. At pages 10 and 11 of the Office Action, claims 1-5 and 8-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claims 1-4, 6, and 8-20 of copending Application No. 10/583,712.

Applicants wish to defer response to the rejections as they are provisional.

Response to Claim Rejections under 35 U.S.C. § 102 and 103

Claims 1-6, 8, 9, 12-13, 15 and 21-26

At page 13 of the Office Action, claims 1-6, 8, 9, 12-13, 15 and 21-26 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent No. 5,211,810 (Bart).

Applicants traverse and respectfully request the Examiner to reconsider in view of the following remarks.

Bart discloses that chemical polymerization of a conductive polymer into a pigment is followed by a coating of a fibrous structure. Thus, polymerizing chemicals, such as the APS, are never in direct contact with the fibrous material, and there is no oxidization of phenolic groups.

Further, Example 3 “Chemical polymerization” of the present application is a valid comparison to Bart, since native fibres and pigments can both be considered as solid surfaces in aniline polymerization.

In Example 3, no attachment of polyaniline to fibres was observed when attaching polymerized aniline to the pigment surfaces (Table 1, Treatment 3). Consequently, electrical conductivity was not obtained in the same reaction conditions when pre-treatment of wood fibers with tag monomers was ignored. Furthermore, the experiments were reproduced several times with the same outcome. The total nitrogen content of the fibers remained < 0.1 % with reference polymerizations. This directly indicates the disadvantage of attaching polyaniline on a surface by absorption or occasional grafting. Furthermore, Example 3 demonstrates that chemical polymerization of aniline can occur without difficulty in an aqueous fiber medium, but the characteristic feature of deep green coloring of the electrically conductive fiber is missing after washing.

According to Bart, the electrical conductivity of paper is produced by a coating layer and not by electrically conductive fiber networks. The process does not include activation of fibers or contact of the fiber with APS or enzyme.

On the other hand, when tag monomers like 3-hydroxyaniline or 4-hydroxy aniline are used, as recited in the present invention, they do not seriously deteriorate the chemical structure of the electrically conductive form of polyaniline.

For at least the reasons discussed above, it is respectfully requested that the § 102, or in the alternative, § 103 rejection of claims 1-6, 8, 9, 12-13, 15 and 21-26 based on Bart be withdrawn.

Claim 11

At page 15 of the Office Action, claim 11 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bart for the reasons of record.

Applicants respectfully traverse. Claim 11 depends from claim 1, and thus, is patentable for at least the reasons discussed above. Accordingly, withdrawal of the § 103 rejection of claim 11 based on Bart is respectfully requested.

Claims 14, 16-20 and 27-30

At page 16 of the Office Action, claims 14, 16-20 and 27-30 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bart in view of U.S. Patent No. 6,187,136 (Pederson).

Applicants traverse and respectfully request the Examiner to reconsider in view of the following remarks.

Claims 14, 16-20 and 27-30 depend from claim 1, and thus, are patentable for at least the reason that Bart does not disclose, teach or suggest all the elements of claim 1 as discussed in above, and Pederson fails to remedy the deficiencies of Bart.

Further, Pederson discloses that the oxidizing agent in the presence of an enzyme catalyzes the oxidation of the phenolic groups (*See Abstract*). In contrast, Bart discloses that the chemical oxidants induce polymerization of the monomer precursor (*See col. 3, lines 34-35; col. 4, lines 5-7*). However, as discussed in above, the chemical oxidants of Bart do not graft the monomer onto the fiber.

The oxidizing agent of Pederson and the chemical agent of Bart are not equivalents known for the same purpose. Therefore, a person having ordinary skill in the art would have no motivation to substitute the chemical oxidant of Bart for the enzymatic oxidant of Pederson.

Furthermore, the presently claimed invention as recited in claim 1 requires an oxidizing agent (such as air and hydrogen peroxide) in the presence of an enzyme (such as laccase) in step a; and an oxidizing agent (such as ferric salts) in step c. Therefore, even if one having ordinary skill in the art were to have substituted the chemical oxidant of Bart for the enzymatic oxidant of Pederson, one would not have arrived at the presently claimed invention.

In view of the above, it is respectfully requested that the § 103 rejection of claims 14, 16-20 and 27-30 be withdrawn.

Claims 1-10, 12-18, 20-26 and 28-30

At page 18 of the Action, claims 1-10, 12-18, 20-26 and 28-30 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Pederson.

Applicants traverse and respectfully request the Examiner to reconsider in view of the following remarks.

Pederson describes a process for the enzyme-assisted grafting of small negatively charged phenolic compounds, such as carboxylic acids, to lignocellulosic material (see, for example, col. 5, lines 21-24). Pederson discloses that the modified lignocellulosic material is treated with a cationic strengthening agent having an ionic charge of sign opposite to that which is conferred on the modified lignocellulosic material (see col. 8, lines 62-65 to col. 9, lines 1-3). The aim of Pederson is to achieve an improvement of the bond strength.

The lignocellulosic material of the present invention is naturally negatively charged, and it contains the groups described by Pedersen, such as groups of ferulic acid. However, Pederson does not disclose that the modified fiber is polymerized in the presence of an oxidizing agent in such a way that one end of the polymer chain is attached to the primed matrix of the fiber.

Therefore, Pederson fails to disclose step c) of the presently claimed invention as recited in claim 1.

Accordingly, withdrawal of the § 102(b) rejection of claims 1-10, 12-18, 20-26 and 28-30 based on Pederson is respectfully requested.

Claims 19 and 27

At page 20 of the Office Action, claims 19 and 27 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over Pederson.

Applicants traverse and respectfully request the Examiner to reconsider in view of the following remarks.

The Examiner's position on this rejection raises the same issues as presented by the § 112, second paragraph, rejection set forth above, and thus, it is respectfully requested that the rejection be withdrawn for the reasons set forth in response to the § 112 rejection.

In particular, in the present invention, the laccase activity was determined as described above, and under the assay conditions at which the enzyme activity was measured, the ranges of Pederson do not overlap with those of the present invention.

Accordingly, withdrawal of the § 102(b) or, in the alternative, § 103(a) rejection of claims 19 and 27 based on Pederson is respectfully requested.

Claim 11

At page 20 of the Office Action, claim 11 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Pederson for the reasons of record.

Applicants traverse and respectfully request the Examiner to reconsider in view of the following remarks.

Claim 11 depends from claim 1, and thus, is patentable for at least the reasons discussed above.

Further, the Examiner states, “The examiner relies on the bi-functional substance and the monomer being the same. The rejection does not rely on polyacrylate.” (see page 5 of the Office Action). However, claim 11 states that the bifunctional substance and the monomer are different. Therefore, it is submitted that the Examiner has mischaracterized the claim, and withdrawal of the § 103 rejection based on Pederson is respectfully requested.

Claims 1-6, 8-11 and 13-30

At page 21 of the Office Action, claims 1-6, 8-11 and 13-30 are rejected under 103(a) as allegedly being unpatentable over Pederson in view of Bart.

Applicants traverse and respectfully request the Examiner to reconsider in view of the following remarks.

Pedersen describes the enzymatic increase of negative charge to the fiber by binding acid components, and utilizing the increased charge for the adsorption of positively charged polymers, with the aim of improving the bond strength of the manufactured paper. Pedersen does not describe the direct binding of a bifunctional group (to be used as the primer of the conductive polymer) to the fiber, or its utilization for attaching the polymer to the fiber.

According to Bart, the conductive polymer that has been polymerized by chemical oxidation is in the form of a pigment, and it is spread mechanically onto the surface of the fibrous material.

According to the Examples of the present application, both chemical and enzymatic binding of the primer component to the fiber prior to the polymerization provide a conductive fibrous material that cannot be achieved without the use of primer (see page 15, Table 1). The

primer components that are to be attached to the fiber cannot disturb the polymerization, therefore, they are preferably selected among the monomers of conductive polymers.

The phenolic carboxylic and sulphonic acids mentioned by Pedersen, do not belong to this group of monomers.

Accordingly, a person having ordinary skill in the art would not have arrived at the presently claimed invention in view of Pederson and Bart, whether taken alone or in combination. Therefore, withdrawal of the § 103 rejection of claims 1-6, 8-11 and 13-30 based on Pederson in view of Bart is respectfully requested.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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